Digitized by the Internet Archive
in 2018 with funding from
University of Toronto

https://archive.org/details/medjournalApr1931uoft

THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

(An Undergraduate Publication)

This journal is published seven times a year, November to May, by the Medical Society of the University of Toronto, to serve as a medium for student expression and to bring to the student recent articles of scientific interest.

EDITOR-IN-CHIEF
C. G. Stogdill, M.A., 3T1.

ASSOCIATE EDITORS
D. A. MacFadyen, B.Sc., M.A., 3T1. J. W. Graham, D.D.S., 3T3.

ASSISTANT EDITOR: D. W. Johnstone, 3T2.
MANAGING EDITOR: E. G. Harkness.
WOMEN'S EDITOR: Miss H. I. McKinley, B.A., 3T3.

YEAR REPRESENTATIVES.
C. D. Shortt, 3T1. G. P. Hamblin, 3T2. B. M. E. Allan, 3T3.
A. B. Noble, 3T4. J. D. Hamilton, 3T5. C. H. Jaimet, 3T6.

With Advisers from the Staff of the Faculty of Medicine.

Address all communications to Room 107, Medical Building.

Volume VIII TORONTO, APRIL, 1931 Number 6

EDITORIAL.

MEDICINE IN THE FUTURE.

Medicine has advanced more in the past sixty years than in the preceding two thousand. Its development has been particularly marked in two directions—preventive medicine, and the application of physics and chemistry to biological problems. As yet even, only a start has been made in these fields, What they will contribute in the future can hardly be guessed. It seems probable, however, that greatest advances will be made where these two fields meet — the prevention of disease through the application of knowledge of the normal biochemical and biophysical processes. Thus; we have only begun to understand the laws of nutrition. In this direction the successes already achieved in the prevention of scurvy, rickets, and deficiencies in teeth point the way. We have only begun to understand, also, the mental processes, and the relation between mental and bodily states. Professor Cushing, in the Lister Day oration, lifted the curtain for a brief moment, disclosing an untracked region when he suggested a relationship between lesions in the diencephalon, whose function is known to be related to the emotions, and peptic ulcer, one of the prominent etiological factors of which has long been known to be worry. It begins to appear that the physician of the future will be largely concerned with the preservation of normal physical and mental processes in his patients.

Diagnosis and Treatment of Gonorrhoea in the Male.*

By C. A. CHISHOLM, M.B.

As the reader will doubtless understand, it will be impossible, in the space allotted, to give adequate consideration to this subject, upon which volumes have been written. All that I can hope to do is to roughly review this subject in a way which I hope will leave the reader in possession of a few concrete facts, the knowledge of which is very necessary for the successful treatment of a person suffering from this disease.

In the first place, affections characterized by urethral discharge are not all gonococcal in origin. In accordance with their etiology, they may be classified somewhat as follows:

1. **Urethrorrhoea**—a condition representing an excessive quantity of what is in character a normal secretion—is dependent on an over-secretive mucous membrane. The condition has been observed during convalescence from acute exhausting diseases, such as typhoid and scarlet fevers, pneumonia, influenza, smallpox, and the like; or in the course of such chronic infections as tuberculosis, syphilis, advanced nephritis or other debilitating conditions. It may also be seen after prolonged treatment of urethritis. The discharge appears as a colorless viscid material not unlike glyverine, and on microscopic examination shows epithelial cells, a few leucocytes and a variety of bacteria normally present. Spermatozoa are often found.

2. **Traumatic Urethritis** due to:
   - (a) Excessive instrumentation;
   - (b) Irritating injections;
   - (c) External traumatism.

3. **Irritative Urethritis**:

(a) Due to ingestion of certain drugs and articles of food. Among those may be mentioned asparagus, rhubarb, turpentine, copaiba, alcohol, arsenic and potassium iodide;

(b) Dependent on irritating conditions of the urine incident to defective metabolism. Urethritis may be a complication of gout. When large quantities of oxalates or phosphates are found in the urine it may become so irritating as to cause congestion of urethritis.

(c) Due to repeated excessive coitus or prolonged ungratified sexual excitement.

4. **Eruptive Urethritis** occurs during the course of certain acute exanthemata and as a manifestation of urethral herpes or eczema; not uncommonly seen in the course of scarlet fever or smallpox, it is probably manifestation of the enanthem of the urethral mucous membrane.

5. **Mechanical Urethritis** incident to:
   - (a) Urethral stricture;
   - (b) Urethral neoplasms;
   - (c) Urinary calculi;
   - (d) Animal parasites (rarely in children.

6. **Concomitant Urethritis** dependent on diseases of the para and periurethral structures.

7. **Infective Urethritis**:
   - (a) Simple pyogenic — sometimes called irritative or abortive gonorrhoea;
   - (b) Gonococcal;
   - (c) Syphilitic;
   - (d) Chancroidal;
   - (e) Tuberculous;
   - (f) Influenzal;
   - (g) Pneumonoccic.

TYPICAL ACUTE GONORRHOEA IN THE MALE.

Pathology:

Gonococci deposited on the mucosa of the urethra lie upon its surface for

* From the Department of Urology, St. Michael's Hospital, Toronto.

from six to twelve hours. At the end of this time they pass through the mucosa, chiefly through the intercellular substance, penetrating to the papillary layer, and in the neighbourhood of the urethral glands invading the submucosal connective tissue. The epithelia of the follicles of the glandular ducts become infected along with the surface mucosa, but the secreting epithelium of the glands escapes. The mucosa then is the seat of cloudy swelling and round-celled infiltration with desquamation of the superficial cells. The pathological changes are most marked in the neighbourhood of the glands and follicles, the intervening smooth mucosa being comparatively normal. In the later stages of urethritis the mucosa becomes changed from a simple columnar epithelium to a stratified structure with large squamous cells on its surface. If the urethritis is prolonged there is also a development of fibrous tissue which by contraction characteristic of this substance may lessen the caliber of the urethra and obliterate the glands and their ducts.

Incubation:

There is always an interval of time between exposure to contagion and the development of urethral discharge. During this time the germs are multiplying and a focus of inflammation is becoming established sufficiently extensive and intense to excite attention. The time may vary from twenty-four hours to fourteen days, as it depends upon the original strength of the microbic invasion, the seat of entrance, and the vital resistance of the mucous membrane. The usual incubation period is one week. Prophylactic treatment, if not effective, may lengthen the time of incubation. The first symptom of a developing urethritis is often a sense of heat or itching in the glans or at the meatus. The discharge when it first appears may be serious in character, but it rapidly becomes purulent. The symptoms of acute inflammation then become more pronounced, and we have: (1) Swelling of the meatus; (2) discharge becoming more marked from day to day; (3) dysuria and sometimes painful erections. There may be fever and slight malaise. But let it be borne in mind that certain cases of gonorrhoeal urethritis may not be so acute as to complain of any of these symptoms. In the very early stage of serous discharge the gonococci may be found extracellular, but ordinarily they soon become intracellular, and remain so until the declining stages of the disease, when they are again found outside the leukocyte.

This specific inflammation runs its course in from five to eight weeks. If carefully treated the discharge disappears, the urnie becomes clear, and the disease is cured. At times even though treatment has been judicious and has been rigidly carried out, the acute inflammation runs into a chronic form manifested by a gleety discharge lasting longer than eight weeks, or there may be recurrent sub-acute attacks.

This is especially liable to occur in the cachectic, in those of rheumatic tendency, and in patients who are careless in respect to treatment, and impatient under restraint. The prognosis as to time when cure can be expected must always be guarded.

What, then, is the procedure when a patient presents himself complaining of urethral discharge?

1. In the first place, the history — When was exposure? Has there been a previous infection? If the discharge appears within twenty-four hours after exposure and there is a history of previous infection, one must be suspicious that the infection is not a new one and the discharge from a urethral stricture or recurrence from an old prostatic infection must be borne in mind. Has there been prophylactic treatment with a strong solution? This in itself may bring about a urethral discharge. Again, an incubation period of three weeks may mean a syphilitic urethritis, in which case, however, an indurated area will

be found in the urethral wall. It is wise to get a complete history in those cases, bearing in mind the classification of urethral discharges.

2. General physical examination, including blood Wesserman.

3. Genito-urinary examination — Palpate kidneys and bladder, scrotum and contents, also the prostate (per rectum). Inspect penis, note character of discharge. Is there a penile sore? Take a urethral smear and stain it by grams method. If gram negative, biscuit-shaped diplococci arranged in *pairs, fours,* or other multiples of two, showing a tendency to *rectangular disposition* are located within the cellular elements, they are likely gonococci. But it must be borne in mind that they may not be within the cell in the very early stages, or the later stages; that the micrococcus catarrhalis is found in the urethra, and is gram negative; also that staphylococci may, under certain circumstances, take on gram negative characteristics. So the morphology of the organism is one of the important features in its recognition. If gonococci are not found in the smear we cannot be absolutely sure that the patient has not gonorrhoea, and repeated tests are necessary. In doubtful cases the finding of the gonococci on culture is conclusive evidence, but unfortunately inability to obtain a positive culture cannot be given similar consideration.

Lastly, when collecting the urine for general examination, a two - glass test is done, the principle of which follows:

If the urinary bladder is full of clear urine and the patient voids two ounces or more of urine into one glass and the balance into a second glass, he obviously will wash out any pus or shreds that may be in any portion of his urethra into the first glass, then the second glass will be clear. It will make no difference whether there is a small quantity of pus or shreds in the posterior or in the anterior urethra; it will appear in the first glass.

Should there be such a large amount of pus produced in the posterior urethra between urinations that it has forced its way through the weaker sphincter at the vesical outlet back into the bladder there would be no clear urine for a clear second glass — both specimens would be cloudy; the first more so. So it follows that a cloudy first glass and a clear second glass does not necessarily mean that the infection is entirely limited to the anterior urethra, as is sometimes erroneously supposed. This simply means that there has not been enough pus produced in the posterior urethra to enter the bladder between voiding times. In fact, the posterior urethra and prostate are infected to some degree in eighty per cent. of all cases of gonorrhoea by lymphatic absorption.

A few words may be said here about shreds found in urine. Shreds are classed clinically as mucoid, mucopurulent, or purulent, the different groups being differentiated by their relative buoyancy, the mucoid shreds floating near the surface of freshly voided urine, whereas those containing a large amount of pus sink rapidly to the bottom. From a microscopic standpoint, shreds consist of an albuminous matrix, in which are embedded pus cells, epithelial cells and small numbers of bacteria. Post gonorrhoeal shreds that float may be simply from hypersecretion of mucous, and mean nothing providing they do not contain gonococci.

TREATMENT OF ACUTE GONORRHOEA IN THE MALE.

Prophylaxis:

Immediately after intercourse the washing of the penis and surrounding parts with soap and water, then urination with as full a stream as possible. As soon thereafter as practicable medication of the urethral mucosa by: Injection of 3 cc. of 10% argyrol, which is retained for five minutes — or irrigation of the anterior urethra with 1:4000 potassium permanganate; either of these procedures to be fol-

lowed by the introduction of a small quantity of 33% calomel in lanolin into the urethra and thorough application of the same to the glans penis. The value of this medication is doubtful if used later than one hour after exposure.

Abortive Treatment:

It is sometimes possible, when patients apply for treatment within twenty-four hours of the beginning of the symptoms to materially shorten the course of the disease. Ballenger's method is as follows:

The penis is cleansed and the meatus anaesthetized by laying across it cotton wet with ten per cent. cocaine. Thereafter 25 minims of freshly-prepared five per cent. argyrol are injected and retained by pressing the lips of the meatus together and sealing them so with flexible collodion. At the end of six hours the collodion is removed with acetone and the patient allowed to urinate. Water is taken freely, except for three hours preceding the treatment. Five successive treatments are given on five successive days. When the treatments have been successful gonococci have disappeared by the third day. If still present on the fifth day, this form of treatment should be abandoned and systematic treatment instituted.

As one can imagine, the disadvantages of this form of treatment lie in the fact that drainage is stopped by the collodion dressing, and for this reason it has been discarded altogether by many good urologists.

Systematic Treatment of Acute Gonorrhoea.

Exercise and Hygienic Measures:

Advise against violent activity — horseback riding, bowling or swimming. Sexual excitement must be avoided. Bowels must be kept regular. In addition the patient must be informed of the ordinary hygienic measures— cleanliness of the hands, etc. He should also be supplied with a sanitary bag.

Diet:

Highly - seasoned foods, acid fruits, rhubarb, tomatoes, cabbage, asparagus, alcohol and carbonated waters should be forbidden. Meat, tea and coffee may be taken in limited quantities. Two quarts of water should be taken daily.

Oral Medication:

The adherence to oral medicine in gonorrhoea has been based upon a number of factors that have little to support them from a scientific standpoint. The most common in use are the Balsams (sandalwood oil and balsam capabee), the alkaline diuretics, certain analine dyes, and other so-called urinary antiseptics, the sponsors of which would have one believe them to be almost specifics. Personally I doubt the value of oral medication in the treatment of gonorrhoea, except perhaps for psychic reasons, or to change the reaction of the urine if irritating. Large quantities of water are much more beneficial.

Local Treatment:

The substances most commonly used are potassium permanganate, which seems to have the faculty of inducing an adematous condition of the urethral walls inimical to the gonococcus, and the organic silver salts, which seem to be, to a certain extent, specifics. Of the latter argyrol, protargol and neosilvol are used. Argyrol is somewhat in disfavour because of its staining possibilities; neosilvol more in favour on account of its cleanliness. Their therepeutic effects are about the same. Protargol is supposed to be more stimulating to the mucous membrane, and therefore supposedly indicated in conditions of latency or chronicity. Acriflavine and mercurochrome have been rather highly extolled in the local treatment of gonorrhoea, but they do not seem to have changed the general picture of the disease. Any of these drugs are beneficial if used intelligently in sufficiently weak solutions. But it would be much better for the patient if

he never consulted a physician if they are used in strengths which will cause a superimposed chemical urethritis.

There are two methods of local treatment. i.e.: By syringe injection and by irrigation. Argyrol, neosilvol and protargol are used for injections; potassium permanganate usually for irrigation.

By irrigation the urethra is washed with large quantities of fluid, the lotion being made to enter the anterior urethra alone or the anterior and posterior urethra by means of hydrostolic pressure. The apparatus consists of a reservoir, a piece of rubber tubing, four to six feet long, and a blunt nozzel. This treatment should be taken under the direct supervision of the physician.

The following method of local treatment will, I think, be found satisfactory in most cases with acute gonorrhoea. Starting with 1 in 6000 potassium permanganate solution with a water pressure not more than three feet above the urethral level, and the patient having first voided, the glans penis, then the anterior urethra is thoroughly cleansed. At no time is the irrigating nozzle held against the meatus long enough to give the urethra the full pressure of the fluid; it is only allowed to dilate it in the most gentle way. The urethra is then allowed to free itself from any retained permanganate solution and gently filled with one drachm of 5% argyrol, which is held in for five minutes. This is preferably done about midday, or shortly after. The patient is advised to procure an "Ascepto" bulb urethral syringe, given a prescription for neosilvol 5%, and, having been shown how to use his syringe, he is told to take an injection himself morning and night, not to use more than one drachm, and to retain the injection five minutes. If the case progresses favourably, the discharge is much reduced, and the first urine of the two glass test clear with shreds at the end of two weeks. When this occurs the irrigating container is raised two feet and the patient is given high irrigations into the bladder. The bladder is filled three or four times, and the injection is not given after this bladder irrigation. The patient continues to use them himself as formerly.

In the case which responds favourably, the patient is discharge free and the urine is clear at the end of six to eight weeks. The prostate is then gently massaged and the prostatic smear prepared and stained. If the smear contains about ten to fifteen pus cells per h.p.f., and does not contain gonococci, the prostate may be said to be normal. A French 26 sound is then passed into the bladder. This performs a double function:

First—When the anterior urethra is massaged upon the sound, any localized collections of pus, if any, which have not been reached by the treatment, will be broken open;

Second—If there are latent gonococci in the urethra this trauma will stir them into activity, and a discharge will re-appear within ten days. There are many who object to this latter procedure. Personally, I think that it is much better to know if gonococci are present, even if there is a recurrence of the urethritis.

Lastly, the patient is advised to return in one month for a check-up.

Acute Posterior Urethritis:

This may occur in spite of all precautions — yet it is sometimes caused by carelessness. The condition is diagnosed by the urine in both glasses being hazy, which is usually accompanied by marked frequency. The prostate is always involved. Hot sitz baths, hot rectal injections, as well as the high urethral irrigations are indicated in this condition. The prostate should not be massaged at this stage or when the disease is acute.

Chronic Gonorrhoea:

A purulent discharge lasting more than eight weeks is indicative of chronic urethritis or "gleet." The essential, and often the only, sign of chronic ure-

thritis is pus. This may be discharged from the meatus, particularly in the morning, or may be found only after careful examination of the urine. Briefly stated, the treatment of chronic urethritis consists of (1) the recognition and removal of the underlying cause of the condition; (2) the treatment of the urethral inflammation.

The order of procedure is as follows:

(a) Examination of the postate and seminal vesicles, expressing and examining their secretions

(b) Exploration of the urethra for stricture with a Bougie à Boule.

(c) Palpation of the urethra distended by a sound for detection of infected follicles; these when filled with secretion give the sensation of small shot.

(d) Urethroscopy.

Infection of the postate and seminal vesicles is responsible in a great many of these cases for prolongation of the urethral discharge. When pus is found in the postate in a chronic prethritis, or in the late stages of an acute urethritis, the gland should be gently massaged—not more often than every three days. As a mild infection of the posterior urethra is present in such cases, posterior instillations are also indicated. These are to the posterior urethra what injections are to the anterior. 2 ccs. of 1 in 1000 silver nitrate may be used and deposited in the posterior urethra by means of a Keyes' Instillator. This should not be done more often than once a week. The strength of the solution is gradually increased up to ¼ to ½%.

When infected follicles have been found in the anterior urethra and broken down, the discharge may recur to some extent, necessitating further treatment by anterior irrigation and injection.

Urethroscopy is useful to determine local lesions which are keeping up a chronic discharge. When found such lesions may be cauterized through the urethroscope with 20% silver nitrate.

Vaccine and Serum Therapy:

These agencies have not given sufficiently good results in the treatment of urethral conditions to warrant their routine employment.

COMPLICATIONS OF GONORRHOEA

The general complications of gonorrhoea are beyond the scope of this paper. Of the more common local complications in the male a few words must be written.

Balanitis and Balanoposthitis: Cleanliness will help to prevent these conditions. When they arise they are best treated by hot boracic compresses or by bathing the penis in hot boracic solution.

Inflammatory Phimosis is often secondary to a balanoposthitis. When a patient first comes under treatment with a vague history and an oedematous swollen prepuce from the orifice which flows blood and pus, it is sometimes difficult to determine the origin of the discharge. A penile sore under an inflamed prepuce will give exactly the same picture. A point in the diagnosis is to have the patient urinate after the preputial sac has been thoroughly cleansed by careful syringing, the urine being examined by the two glass method.

Peri-urethral abscess is inflammatory exudate and pent up secretion of the glands of Littre when their ducts become occluded. This may form a swelling variable in size and may be accompanied by urinary extravasation. Gentle pressure is sometimes successful in rendering patulous the obstructed duct. When softening occurs the absess should be opened and packed with iodoform gauze.

Prostatitis: This condition may be present in the course of a urethritis in varying stages, from the very mild form previously mentioned to the stage of parenchymatous prostatitis, where the whole structure of the gland becomes involved and suppurates. At times a prostatic abscess may develop so insidiously that nothing is suspected until

the patient has symptoms of septic absorption and urinary retention, or both. Examination of the rectum then shows a large fluctuating swelling. This may rupture into the rectum, urethra, or burrow into the perineum or ischio rectal fossa. Very gentle pressure will sometimes cause this absess to rupture into the urethra, which immediately relieves the symptoms. If circumstances demand, the abscess should be drained through the perineum.

Vesiculitis: Inflammation of the seminal vesicles occur as a complication of acute posterior urethritis in a much larger percentage of cases than is generally imagined, the symptoms differing so slightly from those of inflammation of the postate that involvement of the vesicle is not suspected unless a rectal examination is made. The treatment consists of massage and, as Thomas recommends, but which is not generally accepted, of voso puncture and injection to the vesicles with collargol or other antiseptic.

Epididymitis: Rarely develops before the third wek of gonorrhoea. It occurs in about 15% of all cases and is due primarily to involvement of the posterior urethra in the inflammatory process. Neglect of treatment, coitus, exposure to cold, alcohol, too early high irrigation, too early massage of the postate, all tend to develop of this complication. The infection in the epididymis may be mild, responding quickly to treatment, or it may be very severe from the onset. When it develops on the right side it often simulates appendicitis, as the patient does not complain of pain in the scrotum, but pain along the course of the vas, as it enters the inguinal canal. Palpation of the epididymis at this stage may reveal slight tenderness only.

When this complication develops the patient is put to bed, the scrotum supported, and an ice pack applied. Local treatment is discontinued, fluids are pushed and the bowels kept open. If this treatment is not effective within one week, heat is applied in the form of hot compresses. Diathermy has been used with success. Yet one hesitates to recommend it, as Belfield has shown that at times it produces atrophy of the testicles in rabbits. A persistent epididymitis, which fails to respond to the above treatment within a reasonable time, or one that is causing much discomfort, may be "punctured." With a Wasserman needle multiple punctures are made into the epididymis. This helps to relieve the tension and provide temporary drainage, as will be seen by the multiple beads of pus which so often appear following this operation.

THE QUESTION OF CURE.

One of the greatest difficulties in the management of a case of gonorrhoea is to determine when the patient has ben cured; yet it is a most important matter, not only to the patient himself, but to those with whom he may have sexual relations.

There are two great classes of cases in which this matter comes up for decision. The first class consists of those in whom there seems to have been a complete restoration to the normal, in which every examination fails to show the least sign of disease. These cases may be pronounced cured after the second negative test.

The second class consists of those who still have shreds in their urine, possibly a small mucoid drop at the meatus on waking in the morning, and whose prostatic secretion still contains an excess of leucocytes. Under such circumstances the giving of a proper verdict may be a matter of extreme difficulty, for we know, on the one hand, that gonococci may lurk in the depths of the tissues for several years —just how long we do not know—and, on the other hand, that it is possible for a chronic urethritis, prostatitis, etc., to persist for months and years after all gonococci have been destroyed. The finding of pus in the urine or in the prostatic secretion is therefore not convincing evidence that gonococci are

present, yet it indicates the possibility, even the probability, of the presence of these organisms, and it is only after prolonged yet futile search on at least six different occasions that a certificate of health may be given.

The examination to which the patient should be submitted to determine the state of his health should consist, first of a search for pus from the urethra and adjacent organs, especially the postate and seminal vesicles; and. second, if pus be found, of a careful scrutiny of these exudates by stained smear and culture to determine their bacterial content.

Obstetrics in the Home.

By K. C. McILWRAITH, M.B.

The title suggests a comparison between home and institutional practice. Statistics from Toronto and many other places show a much higher maternal death-rate in institutions. This is largely due to the moving of difficult cases to institutions either before or after attempts at home delivery. It is a good rule to send all elderly primiparae and all other patients for whom difficult labour is predicted to a well equipped hospital. I am presuming that you can detect the possibilities of trouble. Making due allowance for this selecting of cases it would still seem that there is an especial danger in gathering a number of lying-in women together. The closer the contact, e.g., in public or semi-public wards, the greater the danger. The natural immunity. too, which a woman acquires to the germs of her own home may be sacrificed by removal to a hospital.

The favourable results obtained in private ward hospitals is maintained only by incessant vigilance over a long line of human agents. A slip, apparently slight, may have disastrous consequences, especially in times of epidemics such as those of "Flu." Home work, therefore, for normal cases, may be said to start with mortality statistics rather in its favour. This favourable balance is increased when hospital technique is applied to home work, and it is the purpose of this paper to show how this may be done.

The room. A good-sized, well-lighted, ventilated, and heated room should be chosen and thoroughly cleaned.

The bed. A rather high, single, enamelled bedstead with a firm mattress, or springs kept from sagging by boards thrust under them is needed. Spare leaves from the dining-room table may be used for this purpose. The wooden bedstead with board sides is hopeless for perineal repair work in the cross-bed position.

Dressings. Sterilized hermetically-sealed bundles containing the minimum amount of dressings required are on the market at the price of $1.05. The patient's night-gown and bedclothing should be scrupulously clean. Doctor and nurse must wear sterile cap gown, mask and gloves. I wish to refer particularly to the mask. The chief habitat of the streptococcus haemolyticus is the mouth, throat, and nose. It is obvious that if anyone about the patient is a carrier all other precautions may be defeated by spray or droplet infection form this source. Masks, therefore, thick enough to be effective, and covering both nose and mouth should be worn. Infection has been pretty definitely traced to this source. In repair operations sterile draping, especially over the arms. is essential.

Labour. At the onset of labour the patient's lower bowel is emptied by enema and the bladder also if necessary by catheter. The pubes is shaved

and the patient given a bath. The inner sides of the thighs, lower abdomen and perineum are washed again with green soap and laved with ½% lysol solution. This whole procedure except the bath and shaving may have to be repeated if the labour is prolonged. The nurse should have on hand a plentiful supply of water which has been boiled, covered and allowed to cool. This is used for cooling instruments and making solutions of antiseptics. Lysol is the antiseptic generally used (½% solution). Bichloride tablets are more convenient to carry, but the solution corrodes metal instruments and is worse than useless as a lubricant.

If forceps are used, a copper pan long and deep enough to allow the complete immersion of the instruments in water for boiling must be carried. Shock or haemorrhage are given as the cause of death in a number of cases. I fear some such cases are the result of premature or otherwise unskillful use of forceps. Do not fall into this error. Go the limit in avoiding their use. Judicious use of narcotics will help your patient to endure. Chloroform given for too long a time predisposes to post-partum haemorrhage. Gas-oxygen for second stage pains is much better. Ether is slightly better but more disagreeable to the patient.

You should stay with your patient until the third stage is complete, and for an hour afterwards. You should have a hypodermic syringe and ampules of aseptic ergot ready for use. It is a good plan to leave some tincture of ergot with the nurse for administration in case of too free haemorrhage after you leave. After pains may be very severe. You should leave a morphine, or aspirin phenacetine caffeine and codeia tablet with the nurse to be given for their relief. It is a legal requirement in Ontario that one per cent. silver nitrate or twenty-five per cent. argyrol shall be dropped in the child's eyes immediately after birth. It is often very difficult to do this, for the infant screws his eyelids tightly together, and the lid becomes everted but not opened. Remember the Duke of Wellington's advice, "Don't fire till you can see the whites of their eyes." Pituitrin to increase contractions should not be used except in cases of multiparous labour in the second stage where the exit is quite unimpeded. For spontaneous delivery the left lateral position is often more convenient.

Recent Advances in Athletics.*

By A. HEMINGWAY.

In a day when decadence is a fashion and things are less than ever what they were, it may come as a surprise to learn that in at least one department of human endeavour an increase may be recorded.

The making of comparisons necessitates the fixing of standards and for the study of athletics we have available a mass of tables extending with accuracy over at least 40 years. A perusal of such tables shows the interesting fact that though improvement is to be recognised generally throughout all branches, the distribution is unequal. For instance in the 100 yds. the time of A. F. Duffey (1901) who ran the distance in 9 3-5 seconds has been equalled but not excelled. On the other hand the record for the mile race which stood to J. P. Jones (1911) at 4 min. 15 2-5 sec. has been lowered by stages ending with P. Nurmi (1923) who covered the distance in 4 min. 10 2-5 sec. Perhaps the point we are endeavouring to make will

*Reprinted from The Leech, University of Bristol.

be made clearer if we turn over the pages of our record book to the Olympic Games records. Of the records made prior to 1924 for foot running, the only ones still standing are those for 100 metres (10 3-5 sec. in 1912) and 200 metres (21 3-1 sec. in 1904) although these times have been equalled on a few occasions. But 1924 and 1928, particularly the latter year, showed new records established at longer distances up to 10,000 metres.

The performances recorded at the Olympic Games may be taken as representing a natural constant for human muscular effort. They are not dependent as are individual records upon the "form" of the individual or the framing of handicaps specially designed to pull out the would-be record breaker, so it is justifiable to assume that at short distances past achievements are not being bettered, whereas long distance runners are still capable of improvement.

Digressing for a moment to consider the exercise practised by race horses, it is found that despite efforts to improve build and performance by breeding, the recorded times for the classic races have not undergone any marked diminution during he last 200 years. So increase in muscular power alone does not lead to increased speed, for the style of running and the ability of the rider to exhaust the animal may be assumed unchanged.

This may help to explain why the standards of sprint performances are becoming constant while those of longer races improve. There are two factors combining to limit the performance of human muscles. One, the internal resistance—"viscosity"—the action of which is maximal on quickly contracting muscle. So, assuming that at each contraction a certain amount of energy is available, the external work done diminishes as the time of shortening decreases, because of the increased internal work which has to be done to overcome the viscous resistance, and in the limit would become zero. On the other hand, the oxygen requirements of the athlete impose a limit upon the rate and duration of his effort. A. V. Hill (2) has suggested that effort can continue until the body has incurred an "oxygen debt" equivalent to about 11 litres, while the maxmum rate of intake is approximately 4 litres per min. Thus, onset of fatigue is capable of being retarded by economy of oxygen usage.

It is the first of these factors which limits the sprinter. No matter how perfect his style, he is curtailed when an increase in the contraction speed of his muscles fails to lead to the development of useful propulsive energy, and it seems unlikely that muscle viscocity should change. Therefore, the best sprinters are those whose present the minimal internal resistance to change of shape. Indirect measurement of "vicosity" in various sprinters including P. Williams, the winner of the 100 and 200 metres races at the 1928 games, by Best and Partridge (3), shows that this is true, since Williams was superior to the others in the smallness of his "viscocity factor."

At the distances between one mile and ten miles there has been a steady improvement, accelerated during the past ten years, in the general standard of performance. True, there has been outstanding figures in past decades: W. G. George (1879-1884), A. Shrubb (1901-1904), G. W. Hutson (1912-1914), H. Kolehmainen (1911-1924), — but these athletes were outstanding among their contemporaries. Two new factors appear to have contributed to the advances recorded of late years though both are concerned with the establishment of a more efficient fashion of running than had hitherto been followed. The preeminent athletes of any era must be similar in the relationship between their body weight and propulsive power and in the amount of external energy which can be liberated before the onset of fatigue, otherwise the appearance of champions would be sporadic and there would be no approximation in the standard of their performances. Given then, two athletes of equal potentialities, why is it that the champion of the present

day is able to put up performances slightly better than those of his predecessors?

In the earlier days of athletics it was the custom in distance races for the first stage of the race to be run at a tremendous pace—for a man "to run his opponents off their legs" as was the saying. As a means of winning a race by discouraging a less valiant or wise adversary, these may be good tactics, but they do not lead to the establishment of world's records. Previously it has been stated that "viscocity" acts as a retarding force to the rapidly shortening muscle and becomes relatively greater as the speed increases. Therefore a race is run most efficiently at a constant pace, higher speed at one period not being adequately compensated by a corresponding slowing at another. The average speed should of course be set so that a maximal oxygen debt and its accompanying exhaustion is incurred by the end of the ace. Coaches, without consideration of the reason have been aware of this fact for some years. Thus in 1921, A. G. Hill had planned to run a mile in 4 min. 8 secs. allotting 1 min. 2 secs. to each 440 yards. Although from trials there was every hope that Hill would set up this record, yet in the actual race he was forced to run the first portion more rapidly than he had intended in order to maintain a position where he would not be obstructed by other competitors. He ran the first quarter in 59 3-5 sec. and the full mile in 4 min. 13 4-5 sec.—a new British record but below the standard which he had set himself. Following a similar plan, P. Nurmi, the Finnish runner, in setting up his various world-records has characterised them all by the remarkable regularity of his running, reeling off lap after lap in almost identical time. So that now, the embryo record breaker must be an excellent judge of his own pace, assisted perhaps, as is Nurmi, by the company of a stop watch in his races.

Accompanying this theory of "constant speed" running, there has been another advance due chiefly to the Finnish school of distance runners. For we must remember that Nurmi is actually only one out of a series of phenomenal distance runners. A distinct change has been introduced into the carriage of the trunk and the movement of the legs, so that the stride is obtained not so much by a spring from the rear foot as by reaching out of the leading foot. It is claimed that this style is more efficient which means that for a given individual's oxygen capacity a distance may be covered at a higher speed. Up to the present but few experiments have been tried in this country, though it would be very profitable to do so since the limit of achievement in distance running is set not as in sprint running by the properties of the muscle but by oxygen usage. If a more economical style can be found then new records may be established.

Some further points of considerable interest arise out of distance races over ten miles. In Marathon races, the speed has been steadily increased, though comparison between races, in different countries for instance, is difficult in the absence of standardised conditions. But in England over the championship course from Windsor to Stamford Bridge a new record was established only last year, when H. Payne ran 26 miles 358 yards in 2 hrs. 30 min. 57 3-5 sec. In races at such distances the body besides running up an oxygen debt suffers a depletion of its food stores, since the muscles are using up large quantities of carbohydrate. Examination of the blood sugars of the competitors in the Olympic Marathon of 1928 demonstrated a low blood sugar in most of the runners, but particularly was it so in those who were most exhausted, one participant indeed being on the verge of hypoglycaemic convulsions. In these races as in those at a shorter distance, steady running is an essential while drinks containing large amounts of glucose should be taken. Attacks of cramp sometimes disable a runner and are probably akin to those experienced by workers in deep mines. They are caused by the salt depletion following excessive sweating, and Newton, the South African runner, who

has recently run a 100 miles in record time makes great use of a beverage compounded of sugar, salt and water.

These then, are some of the reasons why athletic records may still continue to be broken. In field events a similar chronicle might be made if space permitted, of advances in jumping and throwing. The high jump record for instance has soared from 6 ft. 5 5-8 ins. in 1895 to 6 ft. 8¼ ins. in 1924. New techniques have been introduced, some of them fortuitous as Osborne's "Western Roll," others the outcome of careful thought; but on analysis, each finds some physiological explanation based on reflex figures and postures. So that those who would jump to Olympian heights may perchance in the "Korperstellung" of Magnus find the clue.

1. D. G. A. Lowe and A. E. Porritt, "Athletics," 1929.

2. A. V. Hill, "Muscular Activity," Herter Lectures, 1924.

3. C. H. Best and R. C. Partridge, Proc. Roy. Soc. B., 1929, 105, p. 323.

The Early Symptoms of Carcinoma.*

By T. A. J. DUFF, M.B.

My remarks are intended to apply mainly to what may be termed the "hidden carcinomata." The opinions expressed, at the most recent conferences, on cancer, are still quite unanimous that in the vast percentage of our carcinomatous growths — surgery offers the best prospect of cure.

Our success by surgical means depends entirely on obtaining our cases early. How happy for our patients could surgical intervention be instituted at a time when the less radical or what is called the "ideal operation" be performed. We know this happens but seldom, and it is frequently too late for radical removal, and the surgeon must content himself by performing an operation for relief of symptoms only, or resort to irradiation by X-ray or Radium.

Early diagnosis can only be obtained by a proper appreciation of the early signs and symptoms. One does not need to reflect too far into the past to recall how recently one considered loss of weight, cachexia and pain as important manifestations of this dreaded disease. Even to-day one is often surprised in asking the undergraduate in medicine for the early symptoms of any given carcinoma, how frequently he refers to the above symptoms before making mention of those referable to the location of the growth. We realize that these are the very late manifestations of this condition.

In the more recent years we have been laying great stress on what we know to be much earlier symptoms and signs.

May I remind you of the early alteration in the direction of the nipple in breast carcinoma,—the dyspepsia, continuous, the main features are loss of appetite and epigastric discomfort, which is so suspicious of gastric carcinoma, particularly in a male over 40 years of age, which is troubling him for the first time in his life—the alteration in the stools in the patient of cancer age suggestive of cancer of the colon. This change may be more frequent stools, occurring after meals—the unaccountable attack of diarrhoea in right-sided growth—the beginning and increasing constipation in left-sided growth, possibly accompanied by tenderness in the right lower quadrant from distension of the caecum, and on which appendicitis has been incorrectly diagnosed and operated for.

---

*Read at the annual meeting of the Ontario Medical Association, Toronto, May, 1930.

It is unnecessary to refer to haematuria as a first sign of genito-urinary growth; menorrhagia, metrorrhagia and colored intermenstrual discharge in uterine neoplasms; and the attack of piles in rectal carcinoma.

One might enumerate at length on these early symptoms referable to location but time does not permit.

These what may be considered earlier signs and symptoms are particularly stressed in present-day teachings and are becoming more appreciated by those in practice.

Education has accomplished much. In consequence women are continually presenting themselves for examination of their breasts, or to ascertain the significance of irregularities in their monthly illness, or the menopause. It seems the exception, however, for us to be consulted by a patient who has any suspicion of carcinoma of his or her alimentary tract, until the clinical picture is quite obvious and the condition well advanced. Much good is being derived by periodic health examinations, but despite all this the majority of cases are late or advanced when first seen.

This condition of affairs is due in many instances to the patients themselves, who still persist in accepting advice from the "neighbour woman," in taking herbs, in accepting the "druggist man's" favorite prescription, patent or otherwise. Mrs. X. is still inclined to think her discharge as being normal for the menopause. Mr. X. comes to us with a palpable lump in his stomach, having consumed dyspeptic tablets for months. Many still consider certain early signs and symptoms characteristic of growth as those necessarily associated with their time of life. We could enumerate at length delays of the patient necessitated through ignorance or his or her reluctance of knowing the truth.

On the other hand, we must admit our own weaknesses and failure to recognize these earlier symptoms or, if recognized, admit the carelessness and the lack of courage we have shown in insisting on thorough investigations. How many patients, of the cancer age, do we still see whose physician has prescribed, without examination, Nig. Gallicumopii for that first appearance of haemorrhoids; who has prescribed alkali stomachics for that indigestion which is troublesome for the first time in a man's life; who has prescribed bismuth and chlorodyne for that unaccountable attack of diarrohoea; who has prescribed laxatives for that beginning and increasing constipation; who has prescribed douches for that vaginal discharge, which is present for the first time, and if present before, now altered in character and color.

I am afraid this happens more frequently than we are willing to admit; and in patients who do present themselves at this stage, we must admit the responsibility is ours to see that they are most thoroughly investigated, and receive early and appropriate treatment.

May I remind you of a common pitfall. We should be thoroughly impressed with the fact that great improvement has taken place in the patient, even the moderately advanced, on regulation to diet bowels and rest. Let not this improvement, not the optimism of the improved patient, alter our opinion, nor deter us from insisting on the correction of our suspicions, and having every examination made at our disposal to reveal the growth.

One might ask; how long a growth is present before giving localizing symptoms? This will, of course, depend on many factors — the age of the patient, the location of the tumor, the irritation it may be subjected to, and the character of the growth itself. The answer must be that we do not know; but it is a matter of months. It is difficult to obtain any information from which one can draw helpful conclusions. Early growths have been discovered at autopsy where death was due to other causes. An abstract, in the Cancer Review, from an article by

Gale gives the report of 1,818 autopsies on cases of malignant disease in which 183 tumors were discovered which were not diagnosed clinically.

Ernest Miles ventures the opinion that rectal carcinomata requires nine months to encircle three-quarters of the bowel circumference, and at this time the majority of cases have not invaded the fascia propria.

It would seem localizing symptoms are late, otherwise 75 per cent. of rectal growths would not be inoperable when first seen, nor would so many of our left-sided colon carcinomata be admitted as emergencies for acute obstruction, nor would such a large percentage of carcinomata of the stomach be advanced beyond the resectable stage. This I feel is not so, but the explanation, in most cases, rests on the two main factors which I have already referred to, namely, the patients themselves not appreciating the importance of these localizing signs and symptoms, and, what is worse, our failure to be impressed by them.

During the period then, from the commencement of a cancer until localizing signs and symptoms are present —*are there any symptoms?* I find no reference to such in any of the standard texts or current literature. It is to these symptoms I wish especially to refer. I have been impressed how easy it is to obtain these symptoms from our patients. They are given spontaneously, without leading questions.

Possibly I could illustrate best by giving you the brief histories of the following cases:—

CASE 1. Male, aet. 62 years.

Occupation — Auctioneer's bookkeeper.

Admitted to hospital September 21st, 1929.

History obtained by house surgeon was typical of carcinoma of oesophagus.

P.H. Venereal sore and urethritis, 1891.

Present Illness.

Dysphagia commenced in May (four months previously), for which he consulted a physician, who did not then nor until his coming to hospital realize the importance of this symptom. The difficulty in swallowing was first with hard solids, then soft solids, semi-solids and finally liquids. On admission he regurgitated liquids. At this time he was suffering from pain in the epigastrium and back, and had lost 25 pounds in weight. Radiological examination revealed an obstruction just below the level of the bifurcation of the trachea.

Blood and Spinal Wassermans.—Negative.

On October 18th Dr. Gordon Murray, of the Toronto General Hospital, through an oesophagoscope sectioned the growth, dilated the stricture, and inserted a Soutar modification of a Symond tube.

Pathological report—Squamous celled carcinoma. He was able to swallow with comfort until death January 26th, 1930.

This man's first localizing symptom was in May. On asking him when he last considered himself in his usual good health, he immediately replied: "that he had not been himself since before Christmas" (5 months). His symptoms briefly during this time were:

1. Mental weariness.
2. Early physical fatigue.
3. Lack of interest in friends, amusement and work.
4. Loss of energy.
5. Worried over responsibility (afraid of his figures).
6. Weakness.
7. (End of 5 months) Dysphagia.

CASE II. Female, aet 38.

Occupation—Factory worker.

Admitted to hospital November 27th, 1929.

P. H. Negative.

Present Illness.

Slight indigestion in June — some gas and epigastric discomfort. She had to be careful what she ate. In September she had a "break down," with greater epigastric distress afterwards. In October she vomited large quantities every 3 days (food recognized which she ate 3 days before). Her appetite on admission was fair, but she was afraid to eat; vomiting relieved her pain, as did alkalies. In this regard her condition resembled ulcer, but the patient's negative previous history and continuous dyspepsia made one most suspicious of carcinoma with beginning obstruction. X-Ray showed a filling defect in region of the pylorus.

December 11th, 1929, operation — An inoperable carcinoma was found as shown in X-Ray with involvement of the subpyloric and right gastric group of glands and direct extension to the transverse mesocolon. Anterior gastro enterostomy was done, which functioned well. She was discharged from the hospital March 25th with apparently only a short time to live. This patient never consulted anyone until a short time prior to admission. Her first gastric symptoms were in June. She admitted she was perfectly well up to January, nearly six months previously, when she says she was mentally tired at night with no desire for her friends or pleasure. This was followed in order by physical tiredness, loss of ambition in work, afraid she was not doing her work properly, weakness, and, finally, six months later, indigestion.

CASE III. Male, aet 57.

P. H.—Negative.

Present Illness.

January 7, 1929 — Felt tired, had no ambition, felt he was loosing grip in his work.

March 15—Growing sleepy and dull mentally.

March 22—Friends noticed he was somewhat yellow.

March 28—When first seen quite jaundiced.

Explorary laparotomy revealed an extensive carcinoma of the head of the pancreas with marked distention of his bile ducts and gall bladder and enlargement of the liver. The gall gladder was drained, but he only lived three weeks.

It will be noticed that these symptoms, mental weariness and irritability, physical fatigue, loss of ambition in work, friends and pleasure, the worry and responsibility, and finally weakness, were present in all cases, and in two, six months prior to the onset of any localizing manifestation.

How many of us would on these symptoms be carefully on guard in the young boy for other developments of a surgical tuberculosis even without a limp being present or glands palpable, or in the adult be most particular to exclude a tuberculous pulmonitis, or have a thorough blood examination made, lest we might be failing to recognize an early primary anaemia? It seems to me most of us associate these symptoms with early tuberculosis and anaemia, but we fail in realizing that this same train of symptoms is also the picture presented in the early stages of carcinoma.

It is admitted that the number of cases who will consult us at this stage will be small. But could not this small group of cases be enlarged upon by a better appreciation of these the earliest symptoms in carcinoma? Is it not possible also, through this better appreciation of these symptoms and an earlier diagnosis that more "ideal" operations could be performed. or, if radical is done, that a much more hopeful prognosis could be given and more cures obtained? This is the true compensation for any professional endeavour.

Neoplasms of the Colon.

By C. ABERHART, 3T2.

It has recently been pointed out from the statistics of Azerman, Muehler and Madyl, that the incidence of carcinoma of large bowel to that of other parts of the body is increasing and secondly, that the former high mortality rate has been reduced by the introduction of new methods of treatment as well as by a more thorough understanding of the fact that malignancy of the colon, if operable, may be greatly relieved if not entirely cured.

ANATOMY.

Blood Vessels.

The arteries of the colon run in a circular direction round the bowel from the mesenteric border to the free margin, the vessels lying roughly parallel to one another. The arteries of the wall of the colon do not anastomose freely with one another, and in consequence, if care is not taken when resecting portions of the large bowel the blood supply is easily damaged and sloughing results. For this reason it is a good plan, when dividing the bowel, to make the division slightly oblique, so that rather more is cut away at the free margin than on the attached border.

The different parts of the colon differ somewhat as regards the arrangement of the blood vessels. In the greater part of the colon the arteries anastomose by a series of loops just before reaching the bowel; these loops lie close to the mesenteric border of the bowel and form a free anastomosis. In the sigmoid flexure, however, the arteries usually anastomose nearer the base of the mesocolon and then pass straight to the bowel; so that, there is as a rule, no free anastomosis to preserve the blood supply of the colon when the mesosigmoid is cut close to its bowel attachment. This is important when planning any resection of part of the pelvic colon.

There are three branches of the mesentric artery to the colon—the ileccolic, right colic and middle colic. The caecum is supplied by branches from all three arteries.

Jamieson and Dobson have found that the right colic is quite frequently a branch of the ileocolic rather than of the superior mesenteric.

The middle colic artery arises from the superior mesenteric just below the lower border of the pancreas and passes downwards across the sup. mesenteric veins to enter the transverse mesocolon. Halfway to the colon it divides into 2 branches and these again divide near the colon forming the arcades from which branches pass to the colon. The largest of these arcades lies one to two finger's breadth from the bowel along the left two-thirds of the transverse colon and encloses a large area of mesocolon containing very few vessels. The end of this arcade anastomose freely with a branch of the inferior mesenteric artery.

The inferior mesenteric artery leaves the aorta behind the duodenum and passes downward across the left psoas muscle. It gives off the left colic and sigmoid arteries. The left colic, the most important, leaves the inferior mesenteric close to the aorta. It passes upwards across the kidney towards the splenic flexure where it divides to anastomose on the one hand with the middle colic artery and supply the left part of the transverse colon and on the other with the sigmoid arteries to supply the descending colon. There are usually 3-4 sigmoid arteries which anastomose with each other by short arcades; the lowest sigmoid artery anastomoses with the superior hemorrhoidal artery (the continuation of the inferior mesenteric).

This last mentioned anastomosis is important in that should the superior hemorrhoidal be tied below the point of

anastomosis with the last sigmoid the blood supply of sigmoid and upper colon is seriously impaired.

Lymphatics.

The gland groups may be divided into 4 sets:

(1) Epicolic group — are those commencing on the surface of the intestinal wall.
(2) Paracolic group—situated in the mesocolon close to the bowel.
(3) Intermediate group at junction of arteries in the mesocolon.
(4) Main groups found around the region of the main arteries.

The lymphatic vessels arise from the plexuses in the submucous and subperitoneal coats, the deeper vessels escaping chiefly along the entering blood vessels. Many of these lymphatics are interrupted in the epicolic group of glands. The efferent vessels from these and from other interrupted vessels meet the paracolic glands, and thence pass on in the intermediate glands. It is important to note that some of the lymphatic vessels from the wall of the gut pass direct to intermediate glands without passing through either the epicolic or paracolic glands.

There are 3 main groups or chains which can be distinguished.

(1) Middle colic group lying in the middle colic artery at the foot of the transverse mesocolon.

(2) The left colic group lies partly on the horizontal portion of the artery near its origin, and partly on the terminal portion of the mesenteric vein. These glands drain into the sup. mesenteric, coeliac, and lumbar glands.

(3) The inferior mesenteric group lies on the stem of the inf. mesenteric artery —and drains into the lumbar glands, draining the pelvic-colon.

One may note in passing that some of the lymphatics from the left half of the transverse colon drain into the glands at the hilum of the spleen into the gastrocolic omentum.

Jamieson and Dobson also found that there was a communication between the lymphatic and venous systems of the abdomen though they were unable to determine the exact part at which this occurred.

In relation to the spread of cancer it is important to remember (1) that as well as removing a considerable length of gut on each side of the growth, one must also remove all the primary glands and vessels running to this area. It is not sufficient to remove merely the wedge of the mesentery, but a considerable amount of mesentery must be removed if this is possible or compatible with blood supply of remaining parts.

(2) Metastases occur in order of frequency in the following manner, sigmoid, descending colon, transverse, hepatic flexure, splenic flexure, caecum and ascending colon.

CLASSIFICATION.

Classification of new growths in any part of the body are difficult and must of necessity be merely arbitrary. In this article therefore the new growths will be classified under two headings:

1. Benign Tumors: This group consists of only one main lesion of marked importance. This importance is due to its common occurrence and its difficulty of treatment. The condition is that of multiple polypi of large intestine.

There are, however, several other growths varying from rare to very rare in occurrence and being thus correspondingly less important surgically. These growths are (1) Myoma (22 cases), (2) Lipoma (12 cases), (3) Fibroma (5 cases).

2. Malignant Tumors.

The group of malignant tumors may be divided into 3 smaller groups namely (1) Carcinoma, (2), Lymphosarcoma, (3) Sarcoma. Of these groups that of carcinoma is by far the most important and may be divided into (a) Adenocarcinoma, (b) Scirrhus carcinoma, (c) Colloid carcinoma, although some authorities claim that scirrhus and colloid types are merely degenerative changes of the adenocarcinoma type.

The groups of lymphosarcoma and sarcoma are not divided into subdivis-

ions but remain as above. Etiology of both benign and malignant neoplasms is not understood, though there are many theories, for this reason the etiology will be but briefly mentioned here.

1. *Benign Neoplasms.*

The only benign growth of importance being that of multiple polypi its theories of causation will be considered, (a) congenital malformations of the intestinal wall and thus it is believed that this disease can be inherited and that the change is first in the intestinal wall with later change in the epithelium. (b) Chronic irritation of the intestinal wall as a precursor of polypi, e.g., chronic ulcerative colitis.

2. *Malignant Neoplasms.*

Since no one theory of causation seems fool-proof the various theories of causation are merely listed here with few words of explanation except in one case where the data seems to point to a close relationship between lesion and malignancy.

Theories. (1) Constitutional State of Individual. Under this heading we have had advanced such theories as (1) Internal secretions from glands such as thyroid, etc. (2) Vitamines, some thought that since vitamines resembled hormones in their activity they might cause the disease, (3) Inheritability of carcinoma; this work has been greatly studied, particularly in mice, but no conclusive evidence has been found.

(2) The second theory was based upon experimental work by Rouse and supplemented by Bernard when they postulated the theory that new growths were caused by a virus plus a chemical element.

(3) The third theory to be mentioned here is that of chronic irritation. This has been shown by many workers to be at least a factor in causation. Illustrating this Mayo finds that in cases of intestinal diverticular, which are common, being found in some 5 per cent. of all cases having radiological examination of colon, the diverticula appear first as a small out pouching which becomes filled with fecal material and hard debris. This condition now has superimposed on it a chronc inflammatory process causing a diverticulitis. Mayo has found 7 per cent. of a series of these cases had proceeded to carcinoma on operation.

Statistics for benign neoplasms show that the most common of the above classification is that of multiple polypi. These cases have a marked tendency to become malignant and a series of cases by Dukes sets the figure at 75 per cent., while Ewing states 50 per cent. and Mayo 32 per cent.

The other benign neoplasms are rare —the most common being myoma, of which 22 cases are reported. Lipoma having 12 reported cases and fibroma having 5 cases.

Thus it is seen that of the benign group multiple polypi is by far the most serious and this is due to the fact that such high percentages become malignant.

In the case of malignancy, better and fuller statistics are available and one may gather some accurate idea of the importance of these lesions.

In a series of 70,000 autopsies Nothongel, Azerman, Mackler and Madyl found 5,796 deaths from carcinoma. Of these one-fourth were in the intestinal canal; of those in the intestinal canal 35 were in the cecum, 83 in the sigmoid, 131 in other parts of the colon. From other data covering 333 cases the frequency of various parts of the colon is cecum and ascending colon 47.4 per cent., hepatic flexure 8.7 per cent., and descending colon 22.5 per cent.

PATHOLOGY.

Benign. L.

Multiple Polypi, or multiple adenomata or colitis polyposis. This is a rare condition but by no means unknown. It is not a pathological entity but includes several distinct diseases which have been described under this name.

Multiple polypi may be divided into 4 classes as follows: (1) True multiple adenomata, (2) Polypi found in association with hyperplastic tuberculosis, (3) multiple polypi in asscciation with

old strictures of colon, (4) the polypoid condition of mucosa resulting from ulcerative colitis.

Of the above the only one which need be considered is that of true multiple adenomata. This was first discovered by Virchow in 1863.

The number and size of the polypi vary markedly — may be quite small and very numerous or may be large and comparatively few in number. There appears to be two types:

(1) Entire colon covered with small semi pedunculated polypi. This type is rare.

(2) Numerous polypi of all sizes and shapes, some pedunculated and some sessile. The sessile polypi appear to be but an early stage of the pedunculated form. The pedunculated type are large and have pedicles an inch or more in length.

Polypi are more common in the pelvis and descending parts of the colon with very few in cecum and appear to grow from the free edges of the valvulae conniventes.

Microscopically. Polypi consist of a central mass of typical adenoid tissue, covered outside with ordinary columnar celled epithelium of the colon. They are not, however, simple outgrowths of the mucous membrane as the submucous coat is represented.

Careful examination shows that they originate beneath the mucous membrane, probably in the solitary follicles and as they protrude into the bowel, become covered and surrounded by the mucous membrane.

In the pedunculated variety there is, as a rule, no adenoid tissue in the pedicle, which consists of a tube of mucous membrane enclosing connective tissue continuous with the submucous layer of the bowel.

Fibroma, Myoma, Lipoma, need no further discussion beyond the statement that they are benign tumors and therefore are fairly well encapsulated and consist of an overgrowth of typical cells be they fibrous connective, muscle or fat tissue. These tumors may or may not protrude into lumen and may or may not be pedunculated.

Malignant.

The malignant tumors of carcinoma type differ from carcinoma in other parts of the body in that the age incidence is not as fixed. The greater number occur in 5-6 decades but many cases have been reported between the ages of 20 and 30 and a few cases at ages of 3, 5, and 14.

Carcinoma of the colon is also considered by Mayo and others to be twice as common in males.

Carcinoma of large bowel is usually primary but a few cases have been reported secondary to carcinoma higher up in the gastro-intestinal tract, while Sir Arbuthnot Lane has reported a case of secondary carcimona from primary growth in breast. These latter two are very rare, however.

In considering the pathology of malignant neoplasms it is necessary to discuss the above listed types separately as they differ in gross and microscopic appearance as well as in the position in which they are found.

(1) *Adenocarcinoma* — commonly found in right colon—it arises from the columnar celled mucous membranes of the tract and the tubular glands i nconnection with these. Two main forms occur, (1) the nodular which projects as an ulcerated mass, polypoid in form, into the lumen, (2) sessile form which infiltrates the wall and produces a localized thickening. The mucosa at the edge of the growth changes suddenly—the glands becoming highly irregular with numerous branching processes which may be filled with epithelial cells. The cells stain more darkly than the normal mucosa, frequently they slow metosis and are not limited by a smooth basement membrane. In addition these cells have lost all normal relation to each other and in many cases glands will be found in positions in which they never occur, e.g., deep to the muscularis mucosa. The stroma is densely infiltrated by inflammatory cells.

Macroscopically — one sees a cauliflower like moss, usually gray in appearance, hanging out into the lumen —the surface of this mass is usually necrotic, friable and bleeds easily.

2. *Colloid Carcinoma*—is frequently found in the colon, mostly on right side, and is considered by some to be merely a degenerative process of the other type of carcinoma.

Macroscopically it appears as large masses of gelatinus new growth, on section appearing like sago pudding, accompanied by great thickening of wall of intestine. Microscopically the whole section appears a more or less homogeneous mass with only islands of atypical carcinomatous cells to be found. Peculiarly when the above picture is present, it is observed that the metastases formed present very much the same picture.

3. *Scirrhus*—commonly found in left colon—this carcinoma is a type of carcinoma simplex in which the microscopic picture is featured by enormous amounts of connective tissue cells, very dense and scar-like in character in which the cells are scanty and arranged in small groups and columns. Mitotic figures are not common in this type.

Macroscopically we find a mass densely hard in which the typical picture is a signet ring or annular growth around the whole intestine, constricting the lumen. Upon section with knife it imparts a gritty feeling resembling that experienced when one cuts an unripe pear.

4. *Lymphosarcoma*—invades the intestinal mucosa in region of cecum and may pass on into the cecum. It is a very rare condition with no typical macroscopic appearance. Microscopically, it resembles normal lymphoid tissue, but shows no trace of architecture characteristic of lymphoid gland being supported by a very fine delicate stroma. One important point about these tumors is that they do not produce ulceration.

5. *Sarcoma* — Lockhart - Mummery cites 7 cases of sarcoma, only found by diligent canvass of cases, thus one may conclude that it is rare.

The tumor may be of 3 types—(1) fusiform cell type, (2) myosarcoma, (3) fibro sarcoma. The mucous membrane is at first intact and is spread over the tumor which originates in the interstitial tissue of the bowel wall, and tends to spread along the submucous and subperitoneal layers both circularly and longitudinally, thus causing a marked increase in the thickness of bowel wall.

SIGNS AND SYMPTOMS.

(1). Benign Tumors.

As a general statement, one may say that there are no characteristic symptoms to these tumors, but usually one has (1) intermittent and colicky pain localized to one point and originating each time in the same place; (2) the patient may vomit or may have alternate constipation and diarrhoea. Lockhart-Mummery, on the other hand, says that in multiple polypi, (1) there is always a diarrhoea of a severe type, with blood and mucous in the stools; (2) most patients suffer from vague to severe abdominal pain usually on the left side and accompanied by a sense of fulness; (3) patient wastes and becomes emociated, from loss of fluids; (4) Colon is tender when palpatated through the abdominal wall.

(2) Malignant.

In the case of carcinoma it is best to divide the signs and symptoms into two groups: Early symptoms are those to which we must pay particular attention, as an early diagnosis is our desire in all these cases. These signs and symptoms, of course, vary; the main ones, however, are: (1) increasing constipation with colicky abdominal pain or sense of fulness; (2) alternate attacks of constipation and diarrhoea; (3) blood and mucus passed in the stool. It is wise to note here that diarrhoea is very prominent in lesions of right side with a very slight tendency toward constipation; (2) that

signs of obstruction are rare in lesions of the right side, but when it does occur it is very severe and associated with marked toxemia; (3) colicky pain is usually associated with lesions situated in the flexures, and distal colons.

The later common signs and symptoms are: (1) the ability to palpate a mass through the abdominal wall. This may be accompanied by a tenderness during the active palpation.

(2) Continuous pain may occur due to involvement of other viscera.

(3) Anemia, fever, loss of weight and indigestion occur. These may not necessarily be end stage signs in that a careful history will almost always elicit some change in weight before the appearance of the mass. In regards to the anemia mentioned above, Coons states that it is very marked in lesions involving cecum. He cites a case where the hemoglobin had gone as law os 30%—he believes that anemia depends on the size of the growth, but has no relation to the amount of ulceration.

DIAGNOSIS.

There can be no advantage in discussing the diagnostic procedures of benign and malignant neoplasms under separate headings since the procedure employed is common to both.

The diagnosis in these cases is one in which great care must be taken. For the purpose of discussion diagnosis may be considered under the following heads:

(1) History—here, as in disease of all kinds, one must be thorough and painstaking. One must make sure that the patient has told everything and particularly in regard to any abnormalities, no matter how slight, in gastro-intestinal functioning.

The next step in diagnosis is that of routine physical examination. In these cases, however, although one does not neglect other parts, particular attention and care is given to certain portions of the examination, namely, the palpation of the abdomen and secondly, the complete rectal examination supplemented, if need be, by a sigmoidoscopic examination. The next step in diagnosis is the use of barium enema and X-ray machine. This was found to be unsatisfactory, and of late years Fischer modified the old treatment by first administering a barium enema and then with patient on his right side under the screen by inflating the bowel with air. The position of the patient is then changed so that the whole colon is examined. Very small and early tumors may be discovered in this way.

The next step is the laboratory tests of faeces for blood and mucus. This should be done by those expert at this work—otherwise small amounts may be missed. Many workers recommend in this regard the use of chemical tests as well as microscopic examination.

Should all the above procedures prove unavailing in a patient suffering from diarrohea and constipation and over the age of 40-45, one is justified in requesting that patient report back for further examination in one month.

Some even go so far as to say there that the patient should be told plainly the possibilities and allowed to settle for himself the problem of exploratory laparatomy where physical findings are negative and yet the patient's symptoms are real.

TREATMENT.

The treatment of neoplastic conditions of the colon has been changed markedly of late years in order to lower the mortality rate at operations. The present day treatment may now be divided into three stages, namely, postoperative.

(1) pre-operative, (2) operative, (3) post-operative.

1. The pre-operative stage in short consists of treating the symptoms of the patient and endeavoring to relieve them. Thus the main thing to be done in cases of obstruction is to overcome the obstruction and restore the lost body fluids. The second important

point is that one must correct the apparent anemia (usually marked in right colic lesions) by repeated transfusions if necessary. Other complications may be encountered, such as chronic myocarditis and nephritis due to the toxemia. Evidence of these should be ascertained by means of kidney function tests and electro-cardiograms before operation is undertaken.

Before actual operation and at the time of operation the surgeon must keep in mind the possible causes of immediate death as well as the ultimate causes of death in order to intelligently decide upon his procedure.

The immediate causes of death are divided into two classes, (1) common causes of immediate death, (2) less common causes.

1. The common causes in order of importance are: (1) Institution of radical operative measures before sufficient pre-operative treatment has been accomplished. (2) Improper selection of area for resection with resulting gangrene. (3) Infection and abscess formation in wall of the bowel at suture line. (4) Paresis and obstruction of bowel at the operative sight from gas pressure.

2. The less common causes are: (1) shock, (2) pulmonary emboli, (3) thrombosis, (4) pneumonia.

3. The ultimate causes of death are: (1) recurrences at some other site in bowel, (2) spread by metastases to some other organ, such as liver.

2. Operative stage.—Operative methods will depend on two factors: (1) the location of the neoplasm, (2) whether there is obstruction present or not.

1. *Tumors Situated in the Cecum, Ascending Colon and Hepatic Flexure.*

(a) As a general rule, tumors in this situation do not come to operation with obstruction, and for this reason one may do a primary resection without any further preliminary operation. The area of bowel resected in these cases, whether the tumor be in cecum, ascending colon or hepatic flexure, is the same, namely, that portion including the terminal six inches of the ileum, the cecum, ascending colon, hepatic flexure and possibly a small part of the proximal portion of the transverse colon—being sure that the middle colic artery is not tied off during the operation. The distal end of the ileum is now anastomosed to the transverse colon by whichever means the surgeon has selected.

(b) In the cases where there is obstruction at the time of operation it is advisable to supplement the above procedure by a simple ileostomy at some point removed from the first incision.

2. *Tumors Situated in the Transverse Colon.*

(a) In the absence of obstruction a primary resection may be done in these cases. The area to be resected should be three inches to either side of the tumor mass and Parker-Kerr closed method of resection used.

(b) In cases of marked obstruction or in elderly patients, it is advisable to supplement the above with an ileostomy or cecostomy.

(c) Partial obstruction which is unimproved by medical treatment should have a preliminary cecostomy performed.

3. *Tumors of Splenic Flexure.*

The operation of choice at this area is that of a preliminary cecostomy followed by a resection of the colon, including the distal end of the transverse, the splenic flexture and the descending colon down to the point supplied by the ascending branch of the left colic artery; the distal end of the transverse colon is joined to the proximal end of the descending colon by lateral anastomoses due to the great mobilization of the splenic flexure.

Obstruction is practically always the rule in these cases.

4. *Tumors of Sigmoid and Descending Colon.*

Since obstruction is usually present in these areas, a preliminary

cecostomy should be performed. This is followed by radical resection of an area, including the splenic flexure, the whole descending colon and sigmoid.

In treatment of benign neoplasm Lockhart - Mummery has very little to suggest of value beyond the fact that lately they have tried removing the whole colon for multiple polypi, leaving only the rectum. Even this treatment has not had much success.

3. Post-Operative Treatment.—It is the opinion of some surgeons that all cases of carcinoma of large bowel should receive post-operative irridation in order to prevent recurrence. This, however, is not as yet an accepted fact.

Summary of Treatment.

1. Relief from obstruction and cleansing of bowel pre-operatively and post-operatively, relief of toxemia.

2. Safe routine is that of supplementary or preliminary cecostomy or ileostomy where obstruction exists.

3. Preliminary treatment of fluids and non-residue diet as a routine.

4. Careful attention to blood supply in picking areas for resection.

5. Post-operative deep therapy as a routine.

It is generally shown by statistics that those lesions of the right half of colon have a better prognosis than those of the left half, both as far as immediate operative mortality and end results are concerned. This variation is believed by Mayo to be partially due to the different character of the bowel content, that of the right colon being less septic.

In general the prognosis is indicated by the following figures:

In 250 cases—141 are now dead. In 143 cases the bowel was resected. Of these, 40 died in first month, 15 more within 6 months. 89 lived from 6 months to 2 years or more — 25 lived from 6 to 8 years or more, and 12 are alive 8-9 years after operation.

From these facts one may conclude that though the mortality rate in malignant disease of the colon is very high, yet with early diagnosis, intelligent pre-operative treatment, good surgery and post-operative routine, there is no reason why this mortality should not be markedly reduced.

Recent Advances in Kidney Function.

By JESSIE C. GRAY, 3T4.

Histological Structure.

The kidney is composed of a large number of units, each of which is formed of a long unbranched tube, closed at one end at the Bowman's capsule and passing through a devious course—through the proximal convoluted portion in the cortex, then down into the medulla as the descending limb of Henle's Loop, then straight back to the cortex again as the ascending limb of the loop, to pass into the distal convoluted portion and hence into the collecting tubule which leads to the renal pelvis and ureter. It is only the portion from Bowman's capsule to the collecting tubule that is concerned with the formation of the urine, the collecting tubule merely carrying it away to the ureter. The number of uriniferous tubules approaches 4½ million in the human kidney.

The epithelium of the tubule varies so greatly throughout its extent that many histologists have, due to this, ascribed specific functions to the various parts—for example: secretion of water at Bowman's capsule; absorption in the thin (descending) part of Henle's Loop, and secretion in the convoluted portion.

Nerve Supply.

The nerve supply to the kidney is derived mainly from the splanchnics and the Vagus through the semilunar ganglion and renal plexus, but it also receives

fibres from the suprarenal body and the aorta. Stimulation of the splanchnic trunk causes vaso-constriction in the kidney and so stimulation of the splanchnic causes decreased urine secretion. It has also been shown that stimulation of the splanchnic produces immediate vaso-constriction in the corresponding kidney, with a similar constriction following later in the other kidney due to liberation of adrenalin and not to cross-innervation.

The vagus has been found to contain no vaso-motor fibres to the kidney, its action on urine secretion being purely through change in blood flow due to its fibres to the heart.

However, the kidney goes on functioning when all the nervous connections have been severed, which indicates that the nervous control is only superficial.

Blood Supply.

The vascular supply of each unit consists of branches from the renal artery passing through the medulla of the organ to the cortex where a branch is given to each of the Malpighian corpuscles. These break up into capillaries inside the corpuscle which are collected into the Efferent Vessels again, which then breaks up into a series of capillaries on the tubules. These capillaries are collected into the Renal Vein.

The *constituents of the urine* may be formed into a series and at one end there are glucose, chlorides, sodium bicarbonate and amino-acids which occur in the plasma and are retained by it to a large extent, the amounts excreted being small. At the other end there are creatinin and many foreign bodies which have, apparently, no threshold and are excreted in direct proportion to the amounts in the plasma. Between these are the medium threshold bodies such as potassium, urea and urates which are present in the plasma in great excess of their thresholds, and the low threshold bodies like the phosphates.

Theories of Secretion.

There are three chief theories of Renal Secretion. The first was the *Bowman-Heidenhain Theory.* Bowman discovered the renal capsule and he believed that water was secreted here which flushed out the solid salts secreted by the rest of the tubule to form the urine. Heidenhain elaborated this theory stating that the capsule secreted a dilute fluid which was augmented by the salt secretions of the rest of the tubule and also water secreted by the tubule epithelium in cases of diuresis. He claimed that these secretions were made in certain concentrations due to the vital activity of the cells, which is an impregnable defensive argument, but not very satisfactory to the Mechanist.

The second theory, that of *Ludwig,* is that the capsule is a simple filter allowing the passage of all the glood plasma constitutents except the colloids such as the proteins and that this filtrate is then elaborated into urine in the tubules by the *diffusion* back into the blood again of parts of the filtrate constituents. Very soon after publishing this theory, however, he changed the "diffusion" in the tubules to "differential absorption," to account for the different proportions of the constituents in the urine as compared to their proportions in the plasma.

The third story, called by Cushny the *Modern Theory,* accepts Ludwig's theory of filtration through the capsule but supplements the physical forces on which Ludwig bases his whole theory by the vital forces of Heidenhain's theory, when it comes to explaining how the constituents of the filtrate are reabsorbed in the tubules. So, according to this theory, the secretion of the urine consists of two processes—a purely physical filtration at the glomerulus followed by reabsorption in the tubules depending in part on the vital activity of the tubule epithelium. Thus it is sometimes called the *Filtration-Reabsorption Theory.* The reabsorption appears to be selective.

Execretion of Dyes and Salts.

All late work on the excretion of dyes such as phenol sulphonepthalein shows that the greater mass of dye passes through the capsule, though in such dilute solution that it may fail to stain it,

and that fluid is absorbed from the dye in the tubules, leaving it more concentrated. The tubule epithelium is sometimes stained by the dye in the tubule lumen, but this does not indicate that the dye is secreted by this epithlium.

The excretion of salts has been investigated by injection of iron ammonium citrate and ferrocyanide intravenously, because Berlin blue is then precipiated. From such investigations it was found that the excretion of salts is exactly similar to that of dyes, but the risk of post-mortem diffusion is greater in salts than in dyes.

The excretion of uric acid is thought to be of greater moment than that of dyes, because it occurs normally in the urine whereas dyes may be considered foreign substances. Uric acid crystals are found in the tubules and tubule epithelium, which is believed by some to be proof that it is secreted into the lumen by the tubule epithelium. The modern theory contends, however, that water and small amounts of uric acid are reabsorbed in the tubules and this is supported by the fact that larger masses of crystals are found in the more distal parts of the tubules. Folin has stated that urate is a threshold substance in the blood, though this threshold is low, and that thus the crystals are just as likely to be being absorbed as secreted into the lumen.

In Calcium, Phosphate and Iron as in organic salts, crystals occur in the tubule epithelium, but also in less amount in the capsule of the glomerulus—this indicates that presence in the tubule epithelium is due to reabsorption rather than secretion.

In 1926 Hayman and Richards published a paper on the Deposition of Dyes, etc., in the Renal Tubule. Indigo-carmine, sodium carminate, methylene blue, toluidin blue, trypan blue, ferric ammonium citrate and urea were each introduced into the lumen of renal tubules in living frogs by the insertion of a tiny pipette into the Bowman's capsule. In each case the amounts were very minute and it was found that these substances had entered the epithelial cells of the tubules in amounts and manner comparable to that found in these cells when the substances were injected intravenously in larger amounts.

Also the presence of these substances can be demonstrated in the glomerular fluid after intravenous injection.

The conclusion is that the presence of such substances as these in the epithelial cells of the renal tubule wall cannot be taken as evidence that the tubule epithelium possesses secretory power unless it can be shown that the substance cannot pass through the glomerulus—and such a susbtance is unknown.

Work on Frog's Kidney.

The frog's kidney differs from the mammalian in that it is supplied by the renal-portal vein which comes up from the lower extremities, trunk, etc., and breaks up into capillaries on the renal tubules, as well as by the renal artery. It was almost universally held that ligaturing the renal artery completely excludes the glomeruli from the circulation, while the tubules continues to be supplied by the vein, though recent work has thrown doubt on this.

The fact that some of the renal-portal fluid reaches the glomeruli is shown by a paper by Bieter and Hirschfelder in July, 1929, on The Preferential Excretion of Phenolsulphonephthalein by the Glomerulus. They made an aortic-iliac shunt in a frog.

They clamped one aortic arch and connected the other by cannulae to iliac of the same side. They kept up the pressure and washed out the arterial supply to the kidney by prefusing saline into the coeliac artery. Then the only blood supply to the kidney was through the renal portal vein. Cannulae were put into the upper and lower parts of the ureter and the ureter was clamped between the canulae.

They found that after injection of phenolsulphonephthalein, though the volumes of urine from the upper and lower halves of the kidney were the same, there was much more dye excreted from the lower half and they correlated this with the fact that, on injection of

india ink, a much larger percentage of glomeruli are found stained in the lower half than in the upper.

This experiment shows, not only that there is anastomosis between the capillaries of the renal-portal vein and the renal artery in the glomeruli, but is also direct evidence in favour of preferential glomerular excretion of phenolsulponepthalein.

In December, 1929, Oliver and Shevky published on the subject of Relation of the Size of Particles to Dye Secretion. They used six dyes of increasing filterability as shown by using a series of increasingly impermeable membranes. These were injected by the renal-portal vein in the frog to test the tubules and by the artery to test the glomeruli and by this method, they claim that easily filtered dyes like phenol red are excreted by filtration through the glomeruli and the more infilterable dyes cannot filter through the glomerular capsule andrequire the activity of the tubule cells for their elimnation. This work was substantiated by the accidental discovery that raising the pH of the neutral red perfusion fluid causes clumping together and thus enlarging of the particles and gives lessened elimination of the dye. There seem to be several flaws in this argument, however. One objection that Oliver himself points out is that the perfusion fluid is free of proteins and so does not "bind" dye as blood may. Also it is hard to reconcile his method of using the vein to reach the tubules and the arery to reach the glomeruli, with Bieter's work five months previously, showing that substances injected into the vein do, eventually, reach the glomeruli. This factor probably had some effect to make the results less accurate, though not changing the general trend of the conclusions.

Work on Reabsorptive Function of Tubule.

In December, 1929, Bieter did work on the Reabsorptive Function of the Tubule. He injected different dyes into the ureter and collecting tubules, having first ascertained the time for which a certain pressure must be maintained in order to obtain diffusion back to the various parts of the tubule. He found that certain dyes, like phenol sulphonephthalein, were to a large extent reabsorbed in the convoluted portions of the tubule and were carried to the opposite kidney where they were rapidly excreted. On the other hand, certain dyes, like sodium indigosulphonate, were excreted only in traces by the opposite kidney. In these cases, on microscopic examination of the tubules, their epithelium was found to be enlarged, while the dye in the lumen was concentrated to a very dark color. This indicates absorption of water (with traces of dye) in the tubules.

Mercuric chloride in weak solutions greatly increases the viscosity of the protoplasm. Thus it inhibits the reabsorptive function of the tubule epithelium, and Bieter found that poisoning the tubule epithelium in this way inhibits the concentration of the dyes that are hard to absorb—i.e., it inhibits the absorption of water; it also inhibits the absorption of water and phenol sulphonephthalein when this dye is used.

These results are strong support for the Modern Theory of kidney function.

The most direct evidence on kidney function was obtained in Richards' experiments on the chlorides of the glomerular urine as compared to the bladder urine. The manner of withdrawing the glomerular fluid by the newer improved method was described under Work on the Frog's Kidney.

In 1925, using their first method, Wearn and Richards analysed blood plasma, glomerular fluid and bladder urine for chloride. They withdrew the glomerular urine by inserting a very small pipette into Bowman's capsule but did not use any of the precautions later found to be necessary, such as blocking the neck of the tubule.

Their results showed that there was a higher percentage of chloride in the glomerular urine than in the bladder urine. This is a direct evidence in favour of reabsorption in the tubules.

Work on Glomerular Filtration.

A. N. Richards and A. M. Walker on March 31, 1930, published a paper on the Glomerular Elimination of Dyes, in which they say: "Glomerular fluid collected from Bowman's capsule in the frog's kidney may become contaminated by tubule fluid unless precautions are taken to obstruct the neck of the tubule. When this precaution is taken the concentrations of phenol red and indigo carmine in glomerular urine bear the same relations to their concentrations in the blood plasma after injection of these dyes as is obtained when similar plasma is filtered through collodon." This work gives no ground for belief in the existence of any other glomerular process than that of filtration.

The methods were such that care was taken never to touch the kidney itself. A micro-manipulator was used to puncture the Bowman's capsule and withdraw the glomerular urine with a tiny pipette. The neck of the tubule was obstructed by pressing on it with the fine, smoothly pointed tip of a glass or quartz rod. The tubule was located for this procedure by injecting the capsule with dye, which passed down into the tubule—or else, pressure was applied to the lateral side of the Malpighian corpuscle where the tubule was usually found, the complete obstruction of the neck being verified afterwards by injecting dye into the ureter and seeing if it enters the capsule. If it does not, then the neck of the tubule was completely obstructed, and in this way any effects of placing dye in the glomerular fluid are eliminated.

The fact that opening in the capsule fitted tightly around the pipette was tested by allowing dye to trickle over the surface of the kidney—any glomerular fluid that was stained with this dye was rejected.

Blood was taken from a cannula in the Ant. Abdominal Vein into a glass capillary tube. Immediately on collection, this tube was sealed and centrifuged, the tube then being cut at the junction of the plasma and the corpuscles, the plasma being retained for analysis.

Sterile normal horse serum and Hamburger's solution in equal parts were used as the solvent for the phenol red which was made up to concentration equal to that found in the blood plasma after injection. This solution was filtered through collodion and the ultra-filtrate analysed.

In these experiments, when the tubule was blocked, the concentration of phenol red in the glomerular fluid was exactly the same as that found in ultra-filtrate from the same perfusion fluid through collodion. When the tubules were not blocked the concentration of dye was found to be higher than that of an ultra-filtrate indicating that tubule fluid was also present and that in the tubules there is concentration of dye by reabsorption of water.

So the conclusion stated before was obtained—viz.: that filtration is the only glomerular process for which there are grounds.

Pressure Considerations.

H. L. White, in June, 1929, did work on pressures in the Malpighian corpuscle causing filtration and worked out this equation,—Effective Filtration Head = Glomerular Capillary Pressure —(Intracapsular pressure + Colloidal Osmotic Pressure). Working on Necturus he determined the G. C. P. by finding the height to which the I. C. P. had to be raised to stop circulation in the glomerular capillaries. He determined the I. C. P. by occluding the nephrostome and inserting two pipettes into the capsule. In one pipette he had dye and in the other he had Ringer's solution. He found the height of Ringer's solution required so as to keep the dye just to the tip of the other pipette. This gave the I. C. P. He determined the C. O. P. by putting plasma on one side of Cellophane membrane and Ringer's solution on the other side. Then he calculated the E. F. H.

He found this to be positive in 19 cases out of 28 and in these 19 cases filtration was taking place. But elimina-

tion was also taking place in the other nine cases, indicating a secretory function of the glomerulus. He substantiated this secretory function of the glomerulus of the Necturus kidney by raising the I. C. P. to well above the G. C. P. and noting that there was still elimination. Thus he proved that the elimination of fluids when the E. F. H. was negative was due to change in permeability of the capsule to proteins, decreasing the C. O. P., because elimination takes place when the I. C. P. alone is greater than the G. C. P. So the glomerular membrane both filters and secretes in Necturus.

Rate of Filtration and Reabsorption in Human Kidney.

Rehberg has put forward another theory on kidney function. He believes that no-threshold substances, like urea, pass back into the blood by diffusion in the tubules whereas threshold substances, like Na, are actively reabsorbed. He based his theory on work on the concentrations of creatinin in plasma and urine and calculations of the total amount excreted and the volume reabsorbed in the tubules.

In 1926 he wrote a paper on the Rate of Filtration and Reabsorption, and based his work on the following reasoning on the assumption of the Filtration-Reabsorption theory:

If you take a substance such as creatinin, none of which is reabsorbed during passage through the tubules and call this A, then, letting F be the amount of filtrate formed in the capsules, U be the amount of urine,
Ap% be the % of A in the plasma and Au% be the amount of A in the urine, then:

$$\frac{F \times Ap\%}{100} \quad \frac{U \times Au\%}{100}$$

$$\text{So } F = \frac{Aup\%}{Ap\%} \times U \text{ or } C \times U$$

where C is the index of conc. If R is the amount of fluid reabsorbed, then R=F — U=CXU—U=(C—1) U.

Ap% and Au% can be obtained by analysis of urine and plasma for creatinin and the amount of urine is known. So F and R can be determined.

Rehberg used himself as subject and from his results and discussions of the blood flow in the kidney, the number of active glomeruli and the surface available for reabsorption, he showed that the Filtration-reabsorption theory is quite tenable and that the rate of filtration may be as great as 200 cc. per minute, while the rate of reabsorption is 50-200 cc. pr minute. These figures, of course, are dependent on the amount of diuresis due to ingestion of water, salts, etc.

Effect of Nerve Stimulation on Glomorular Blood Flow.

Bieter, in August, 1929, wrote upon the Effect of Splanchnics on the Glom. Blood Flow. He observed glomerular flow microscopically under normal conditions, on stimulation of the splanchnic and on section of the splanchnic and confirmed Richards' work of 1922 to the effect that glomerular flow is normally intermittent, is decreased on stimulation of the splanchnic (this, of course, causing decreased urine output) and is increased on section, the intermittency disappearing and the urine output being increased. Several hours after section of the splanchnic, however, Bieter observed the intermittency returning and this was accompanied by return to normal urine output.

He also investigated the anuria produced by various irritations to the ureter and found them accompanied by de crease in the number of active glomeruli —also that these irritants were ineffective if the splanchnics had been cut or the irritated part anaesthetized. Therefore the arrest of flow through the glomerular capillaries due to these irritants is apparently due to a reflex vasoconstriction for which the sympathetic fibres to the kidney are essential.

Most Recent Work on Kidney Function.

In June, 1930, Poullson did work on the Sugar Excretion in Phlorhizin Gly-

cosuria. By analysis of plasma and urine for creatinin and sugar after injection of phlorrhizin and ingestion of creatinin, he showed that under these conditions, sugar is excreted in the same concentration that creatinin is. Considering that Rehberg showed creatinin to be a no-threshold body which is filtered through through the glomeruli but not absorbed in the tubules, this is strong support for the filtration-reabsorption theory in that glucose is shown to act in a similar manner when the tubule epithelium is so paralyzed that it can no longer reabsorb sugar.

A paper by Marshall was published in July, 1930, on the Function of Glomerular and Aglomerular Kidneys. He points out that there are just four methods of investigation of kidney function, viz.:

1. Perfusion of the isolated organ—this is an extremely artificial condition.
2. Observations on anaesthetized animals—again the conditions are far from natural.
3. Comparison of blood plasma and urine—this method does not tell much about what is actually happening in the kidney.
4. The study of the morphology and function of the kidney as it is evolved from a single to a more complex structure. In this way functions can be assigned to the various parts of the tubule without disturbing factors of anaesthetic or operative procedures.

Marshall studied the goose fish and the toad fish as aglomerular specimens and the sculpin, flounder, carp and eel as fish with glomerular kidneys. No significant differences were found in the volumes or composition of urine of glomerular and aglomerular kidneys. The elimination of chloride and phosphate was shown to be a threshold mechanism in both kidneys. Thus it appears that the tubule alone in the aglomerular kidney, can carry out the functions of both the tubule and glomerulus in the glomerular kidney.

But on the other hand, the aglomerular kidney differs from the glomerular one in showing a specificity in the elimination of foreign bodies—e.g., the aglomerular kidney eliminates phenol red but not the highly diffusible ferrocyanide. Glycosuria is easily produced in fish with glomerular kidneys, but only a trace of glucose ever appears in urine from the aglomerular kidney even when the blood sugar is high and phlorhizin has been given.

From this work it is thought that the presence of the glomerulus has not completely abolished the ability of the tubule to excrete substances in the fish at least.

The History of Blood Transfusion.

By HELEN I. McKINLEY, B.A., 3T3.

Christopher Wren has two great achievements to his credit: he designed St. Paul's Cathedral and suggested blood transfusion. His idea was translated into reality in the 17th century.

Blood transfusion is the term used in medical literature for the process of transferring the blood from the circulation of one living animal to that of another. The first authentic record of it was not made until the middle of the seventeenth century, when a Florentine physician, Francesco Folli, claimed to have transfused blood from one animal to another on August 13, 1654. Subsequently many experiments bearing on the subject were made by Dr. (later Sir Christopher) Wren, Thomas Cox, Edmund King and Richard Lower, their experiences being recorded in the Philisophical Transactions published by the Royal Society about 1666. Some of these experiments were witnessed by Samuel Pepys, who referred to them in his

Diary. The operation was first successfully carried out by Richard Lower in 1665, when he succeeded in transfusing blood from one lamb to another.

In spite of this activity in England, the credit for first performing a blood transfusion upon a human being must be given to Jean Denys, of Montpellier, an account of whose experiment, carried out upon a boy of 15 years of age, was published in the Philosophical Transactions for July 22, 1667.

On this occasion, and throughout the remainder of the seventeenth century, the blood for transfusion was taken from a calf or a lamb, and although good therapeutic results were claimed at first, the operation soon fell into disrepute and was almost entirely abandoned. Little or nothing was heard of it during the eighteenth century, and it was not until the year 1818 that attention was again focussed on its possibilities. The coagulation of the blood outside the body was always the prime difficulty. One way of overcoming this was to remove the fibrin, so from 1835 onwards this defibrinated blood was used by various operators.

Transfusion did not, however, come into general use as a therapeutic measure during the nineteenth century, and after the year 1875 was largely neglected, probably due to the increased number of disasters which had attended the operation as soon as it began to come into fashion. An improvement in technique was initiated in America through advances in the surgery of the blood-vessels, and this culminated in the work of Dr. G. W. Crile, of Ohio, who served with the British Expeditionary Force in France during the Great War. About the year 1907 he described in detail an efficient method of performing direct transfusion by means of an anastomosis between an artery and the donor and a vein of the recipient.

Meanwhile discoveries were being made which tended to eliminate the chief factor responsible for the fatal results of some of the earlier transfusions. It had long been known that the bloods of different species of animals were incompatible, and in 1907 it was shown by Jansky, in Scandinavia, that an analagous incompatibility existed in all races of man between the bloods of different individuals, so that a given recipient might safely reecive the blood of certain selected donors only. Hitherto no such selection had been practised. Jansky's work was repeated by Moss, in America, in 1910, and human beings have since that time been classified into four definite groups, the blood of only one of these being suitable for more or less indiscriminate injection into all recipients.

A further advance was made in 1914 when Agote, of Buenos Aires, first used sodium citrate as an anti-coagulant for the donor's blood. This substance when mixed with the shed blood of the donor, combines with and removes the calcium, without which the clotting process cannot take place. The blood then remains fluid indefinitely, and the small amount of citrate which it contains is usually harmless o the recipient. Direct transfusion by Crile's method was technically difficult to carry out, so was soon abandoned in favour of the citrated blood. This method was introduced opportunely for use in the treatment of the wounded during the latter part of the Great War. Some surgeons, however, believe that citrate is responsible for the reactions, usually mild in degree, which follow a certain percentage of all transfusions, however carefully the bloods of donor and recipient may have been tested. This supposed harmful effect in spite of much controversy has not yet been proved, and this method, which has many advantages, is more often used than any other. If whole blood was preferred, coagulation was retarded by receiving the blood of the donor into a glass vessel coated on the inside with paraffin, and transferring it to the recipient as rapidly as possible.

In 1923, a return was made by Storer to the older method of using defibrinated blood to which no foreign substance has been added. Storer's ground for eliminating the anti-coagulant was the belief that its presence impaired the anti-bac-

terial properties of the donor's leucocytes, but his condition still has to be substantiated in practice.

Many instruments have been devised for the direct transfusion of blood. At present the favorite is a small thumb operated piston of the syringe type, with valves and short connections between donor and recipient.

Blood transfusion has been found to have its greatest clinical value in the treatment of acute anaemia resulting from loss of blood after injury, bleeding from a peptic ulcer, and post-partum haemorrhage. It is also of value in combating the shock following severe surgical operations, and severe burns, and in the treatment of conditions in which the patient's blood is deficient in its power of coagulation. Thus, in haemophilia, the patient may be rendered temporarily normal by transfusion, and persistent bleeding will cease. Transfusion has been used in the treatment of pernicious anaemia, but although a temporary remission may be obtained the disease cannot thereby be cured.

The limitations of blood transfusion as a therapeutic measure are, therefore, fairly well defined. It has been employed most widely in America in this capacity, but its use is becoming increasingly popular throughout the remainder of the world.

Medical Alumni Association.

Every male graduate in Medicine in the University of Toronto automatically becomes on the day of his graduation a member of the Medical Alumni Association. In order to carry on its work — of which more later — the Association charges an annual fee of $3.00, but of the 4,800 graduates of the faculty only about 700 pay the fees. Each graduate owes as much a duty to the Alumni Association as does the Association to the faculty, and the percentage of members should be very greatly increased.

The Executive, under the presidency of E. A. McDonald, '11, appeal to the graduating class in Medicine for their support and in appealing for new members they draw the reader's attention to the activities of the Medical Alumni Association and the Alumni Federation of the University, of which the Association is a component and very important part. The Medical Alumni Association in itself conducts the annual reunions held at the time of the meetings of the Canadian and Ontario Medical Associations, and generally looks to the welfare of the graduates in their relationship to their Alma Mater.

As members of a constituent association in the Alumni Federation all paid-up members of the Medical Alumni Association receive *the University of Toronto Monthly* each month.

As the years have gone by, the Medical Alumni Association has conserved its slight operating surplus, and two years ago set up the Medical Alumni Association Loan Fund for undergraduates in the faculty. Loans are available only to undergraduates in Medicine and are given without security. They are short term and non-interest-bearing. Each year many undergraduates avail themselves of the privileges of the fund and thus the Alumni Association has made it possible for many students to graduate who otherwise might have been unable to do so. This is but one of the many activities of the Association on behalf of the undergraduates.

As a member of the Federation the Association has a part in and contri-

butes to the Student Employment Bureau, which last year placed approximately 1,800 students in part time, summer or Christmas employment. This work, which is carried on without cost to the students, is something which every graduate who has had to earn a portion of his expenses and has benefited by this service will appreciate and will be willing to support.

The Alumni Federation also presents a series of four scholarships each year in the Faculty of Medicine. These scholarships total $1,000.00 each year and are available only to undergraduates in Medicine.

The University of Toronto Monthly, which goes without charge to all paid-up members of the Association, is the loical way to keep in touch with your classmates and with the doings at the University generally. It is, as you will have noticed from the copies you have seen, a monthly news letter not only about graduates but of all university activities. A great deal of important information is printed in the *Monthly* before it appears in the daily papers. The supplement, added some two years ago, has made the *Monthly* not only an interesting newspaper but has given it a literary value enjoyed by few such publications in America.

The annual fee in the Medical Alumni Association is 3.00, but in order to interest the graduates of 1931 a special fee of $3.00 from the present date until December, 1932, has been set up. This will include subscription for a like period to the *University of Toronto Monthly* and will entitle the member to all the other perquisites of membership in the Federation and the Medical Alumni Association, not the least of which is the privilege of buying special season tickets for the intercollegiate home games in a specially reserved alumni section. This section of the stand is one of the choicest in the stadium, and tickets can only be bought by members in good standing.

Aside from the benefits enumerated above there is also the appreciation of the fact of carrying on a tradition of the faculty. The member helps to strengthen the position of the graduate body of the Faculty of Medicine, and at the same time places himself so that he will at all times be conversant with what is happening within the confines of the university at which he spent six years of his life and to which, knowingly or not, he owes allegiance.

Surgical Instruments---Hospital Supplies

J. STEVENS & SON CO., Limited

Toronto -- Winnipeg -- Edmonton -- Calgary -- Vancouver
London, England

STUDENTS' SUPPLIES

Toronto Office: 145 Wellington St. W. Phone { EL 5416 / EL 5417

BOOK NOTES

TAIT McKENZIE — Sculptor of Youth

BY CHRISTOPHER HUSSEY.

Country Life, London.

Because Dr. McKenzie is a Canadian, born in Ontario, and a graduate of McGill University, this book has a special appeal to us. Because he is a distinguished member of the medical profession, our interest becomes a little more than perfunctory. But the recognition of these facts is not necessary in the appreciation of so excellent a work as has here been produced by Christopher Hussey.

Nor is it necessary to be versed in the intricacies of the art of sculpture to enjoy this treatise on Tait McKenzie, artist and anatomist — his life and work.

The author, in a beautifully bound and printed and profusely illustrated volume, that is in itself a work of art— that very true and very difficult art, the art of the printer — gives us, with an unerring dexterity of touch, a delightful description of McKenzie's life and work, describing in detail without the technicalities that would inevitably destroy the layman's enjoyment of the exposition, a large number of his more important works — their place as works of art and their place as accurate and interesting artistic presentations of anatomical and physiological phenomena; this last phase known to most of us in those four interesting studies, the "Masks of Expression."

We recommend this book without reserve to those who have not already seen it; and particularly do we recommend it to any who might be interested in it as a valuable addition to his library.

THE STORY OF A SURGEON.

BY SIR JOHN BLAND-SUTTON.

Methuen & Co., Ltd., London.

The author has gathered together a series of anecdotes and experiences connected with his long and distinguished career in the surgical world. These reminiscences are pleasant and entertaining and serve admirably to while away a few vagrant hours, while the glimpses he gives us of eminent contemporaries, early and late, are of considerable interest. Pasteur and Lister, Huxley and Manson, and a host of others, are shown to us from time to time, and it is these fleeting contacts that, to our mind, constitute the book's chiefest interest. Coming as it does from the pen of one of the most eminent of British surgeons, we cannot, however, but confess to some disappointment and a sense of dissatisfaction, on laying down the book — a feeling as though there was much of importance the author might have told us and has not.

A.

APPLICATIONS for the position of Assistant Editor of this Journal for the academic year 1931-32 will be received up until April 24, 1931. Members of the incoming Fifth Year are eligible. Applications should be addressed to the Editor, University of Toronto Medical Journal, Room 107, Anatomy Building.

AN ANTISYPHILITIC AGENT THAT WILL NOT PRECIPITATE IN THE TISSUES

THIO-BISMOL

Accepted FOR N. N. R. BY COUNCIL ON PHARMACY AND CHEMISTRY OF THE A. M. A.

BISMUTH, in suitable chemical form, ranks next to arsphenamines as an antisyphilitic agent. In the form of Thio-Bismol (sodium bismuth thioglycollate) it is taken up promptly and completely from the site of injection (the muscle tissues), reaching every part of the body within a short time with rapid therapeutic effect.

The injections cause a minimum of tissue damage, for Thio-Bismol is not only water-soluble but it will not precipitate in the tissues at the site of injection. The injections are usually so well borne and their effects so manifest that the patient is more than willing to continue the treatment for the necessary length of time.

Write for booklet on Thio-Bismol. It will be sent you promptly.

PACKAGES

Boxes of 12 and 100 ampoules (No. 156), each ampoule containing one average adult dose (0.2 Gm.—3 grs.) of Thio-Bismol, to be dissolved, as needed, in sterile distilled water, a sufficient amount of which is supplied with each package.

PARKE, DAVIS & CO.

The World's Largest Makers of Pharmaceutical and Biological Products

WALKERVILLE, ONT.

WINNIPEG, MAN. MONTREAL, QUE.

BEMINAL LIQUID

Prepared from germ of wheat and brewers' yeast, this palatable concentrate presents in liquid form, an unusually attractive medium for Vitamin B therapy. It establishes normal tone and motility of the intestinal tract with consequent improvement in digestion and appetite. The anti-neuritic effect of Beminal Liquid is also particularly valuable in nervous disorders due directly to a deficiency of Vitamin B_1 or indirectly to disturbed alimentary function. Supplied in 16 ounce, one-half gallon, and one gallon containers. *A distinctive Canadian product on a sound ethical plane.*

AYERST, McKENNA & HARRISON LTD. - MONTREAL